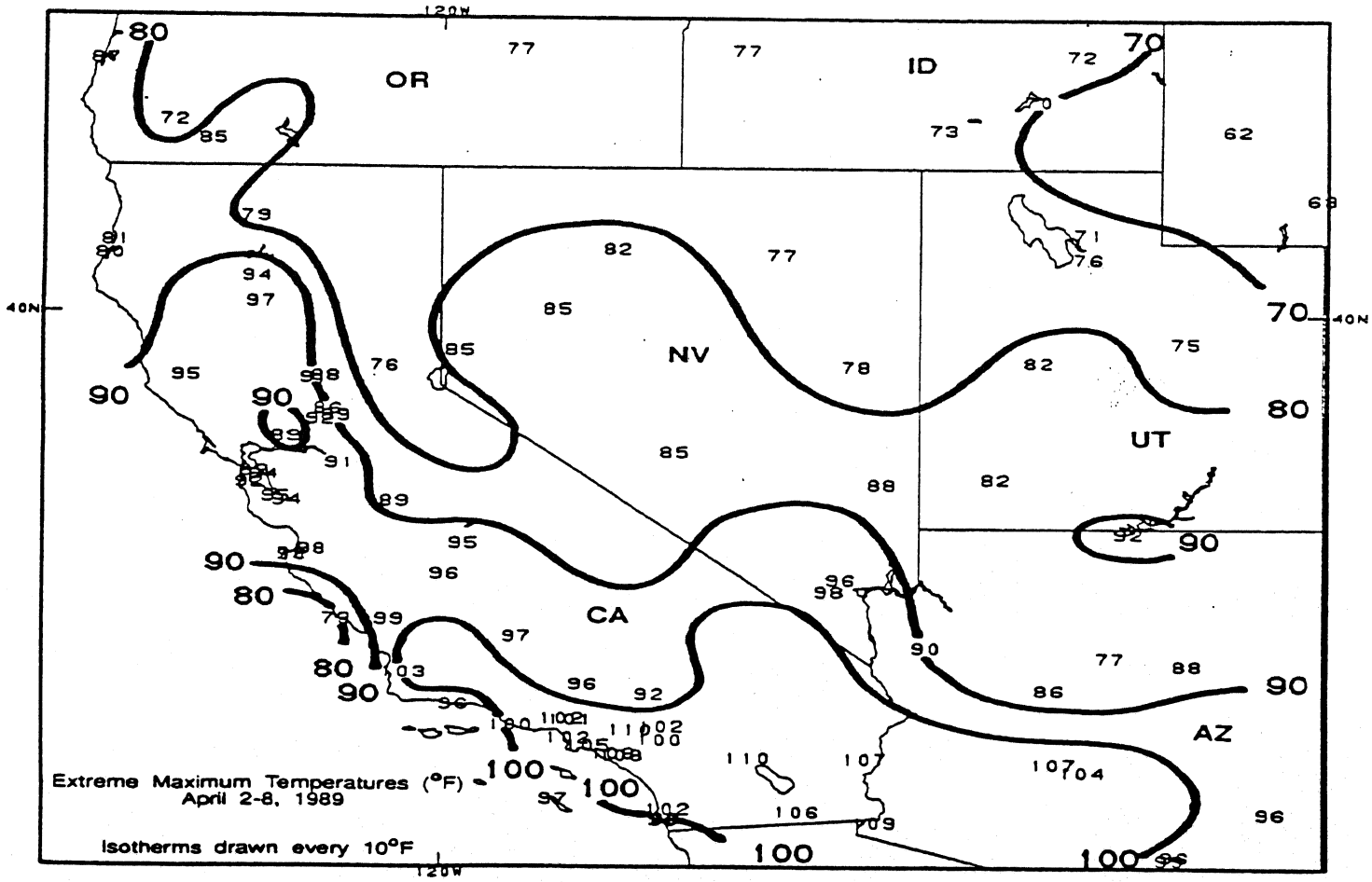
CLIMATE ANALYSIS CENTER

CONTAINS:
MARCH '89
UNITED
STATES
CLIMATE
REVIEW

WEEKLY CLIMATE BULLETIN

No. 89/14 Washington, DC April 8, 1989



MUCH OF THE SOUTHWEST HAS EXPERIENCED UNSEASONABLY WARM CONDITIONS SINCE MID-FEBRUARY, AND THIS WEEK WAS NO EXCEPTION. IN SOUTHERN CALIFORNIA, HOT, DRY EASTERLY WINDS, KNOWN AS THE SANTA ANAS, SENT TEMPERATURES SOARING INTO THE ONE HUNDREDS (106°F AT LOS ANGELES ON 4/7/89), WHILE FARTHER NORTH, NORMALLY COOL SAN FRANSISCO BAKED WITH HIGHS IN THE EIGHTIES AND NINETIES.

UNITED STATES DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL WEATHER SERVICE - NATIONAL METEOROLOGICAL CENTER

WEEKLY CLIMATE BULLETIN

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This Bulletin is issued weekly by the Climate Analysis Center and is designed to indicate, in a brief, concise format, current surface climatic conditions in the United States and around the world. The Bulletin contains:

Highlights of major global climatic events and anomalies.
U.S. climatic conditions for the previous week.
U.S. apparent temperatures (summer) or wind chill (winter).
Global two-week temperature anomalies.
Global four-week precipitation anomalies.
Global monthly temperature and precipitation anomalies.
Global three-month precipitation anomalies (once a month).
Global twelve-month precipitation anomalies (every 3 months).
Global temperature anomalies for winter and summer seasons.
Special climate summaries, explanations, etc. (as appropriate).

Most analyses contained in this Bulletin are based on preliminary, unchecked data received at the Center via the Global Telecommunication System. Similar analyses based on final, checked data are likely to differ to some extent from those presented here.

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GLOBAL CLIMATE HIGHLIGHTS

MAJOR CLIMATIC EVENTS AND ANOMALIES AS OF APRIL 8, 1989

1. Coastal sections of British Columbia and Alaska:

ANOTHER DRY WEEK.

Generally less than 19 mm of precipitation were reported at most stations as very dry weather continued [7 weeks].

2. Uruguay and Eastern Argentina:

AREA STILL DRY.

Although as much as 146 mm of precipitation fell in northern Argentina, most of the region remained extremely dry. Many stations will enter the normally dry winter season (approximately May to September) with significant long-term deficits [41 weeks].

3. Northern Europe:

WETNESS DIMINISHES.

Precipitation totaled less than 27 mm at many locations in the region as drier weather prevailed [Ended at 5 weeks].

4. Central and Southern Europe:

REGION REMAINS WARM.

Unusually warm conditions persisted as temperatures averaged as much as 11°C above normal [13 weeks].

5. Siberia:

MILD CONDITIONS PERSIST.

Temperature departures approached 13°C above normal as unusually mild weather continued [26 weeks].

6. Eastern China, Korea, and Japan:

MORE WARM WEATHER.

Abnormally high temperatures, reaching 7°C above normal, prevailed across the region [8 weeks].

7. Philippines:

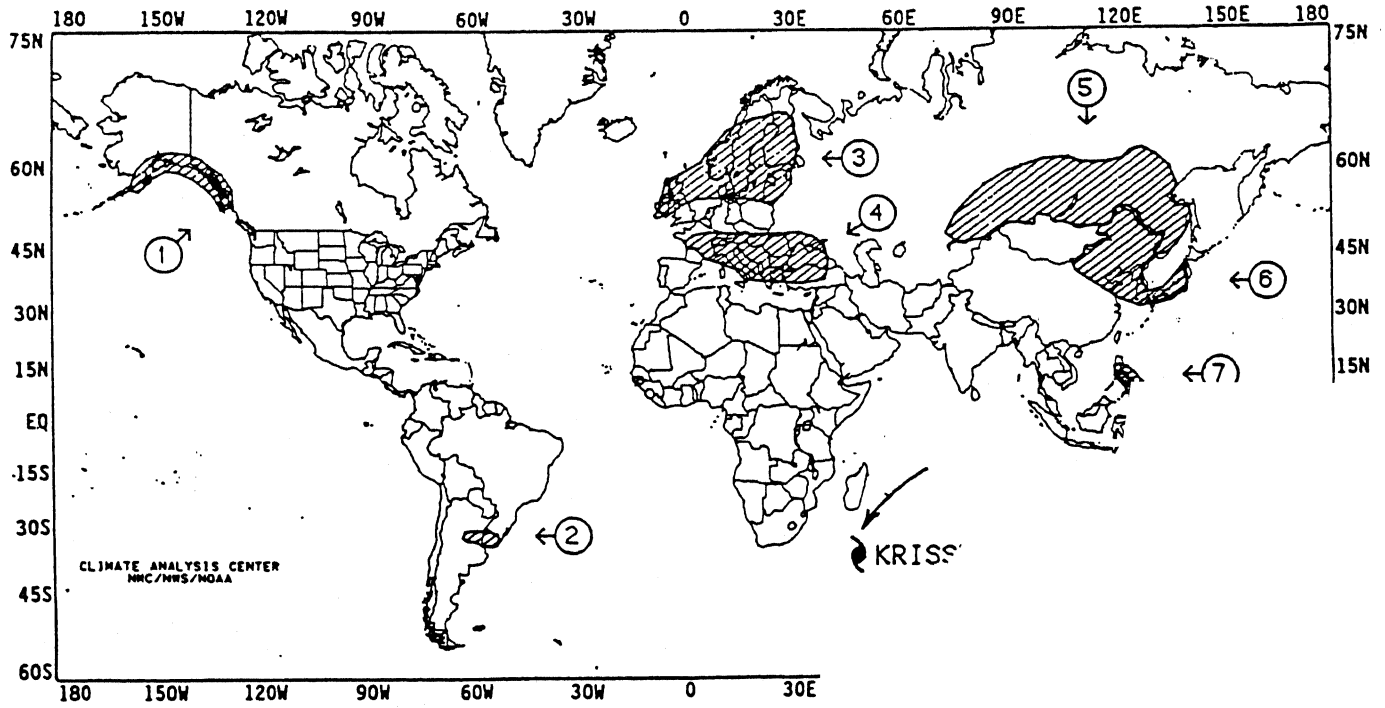
WETNESS EASES.

Precipitation totals were generally below 26 mm as drier conditions returned [Ending at 6 weeks].

8. Australia:

"BIG WET" CONTINUES.

More heavy rains, up to 301 mm, fell at stations throughout the eastern half of the country as unusually wet weather persisted [4 weeks].



EXPLANATION

TEXT: Approximate duration of anomalies is in brackets. Precipitatio
week's values.

MAP: Approximate locations of major anomalies and episodic events are shown. See other maps in this bulletin for current two week temperature anomalies, four week precipitation anomalies, long-term anomalies, and other details.

UNITED STATES WEEKLY CLIMATE HIGHLIGHTS

FOR THE WEEK OF APRIL 2 THROUGH APRIL 8, 1989.

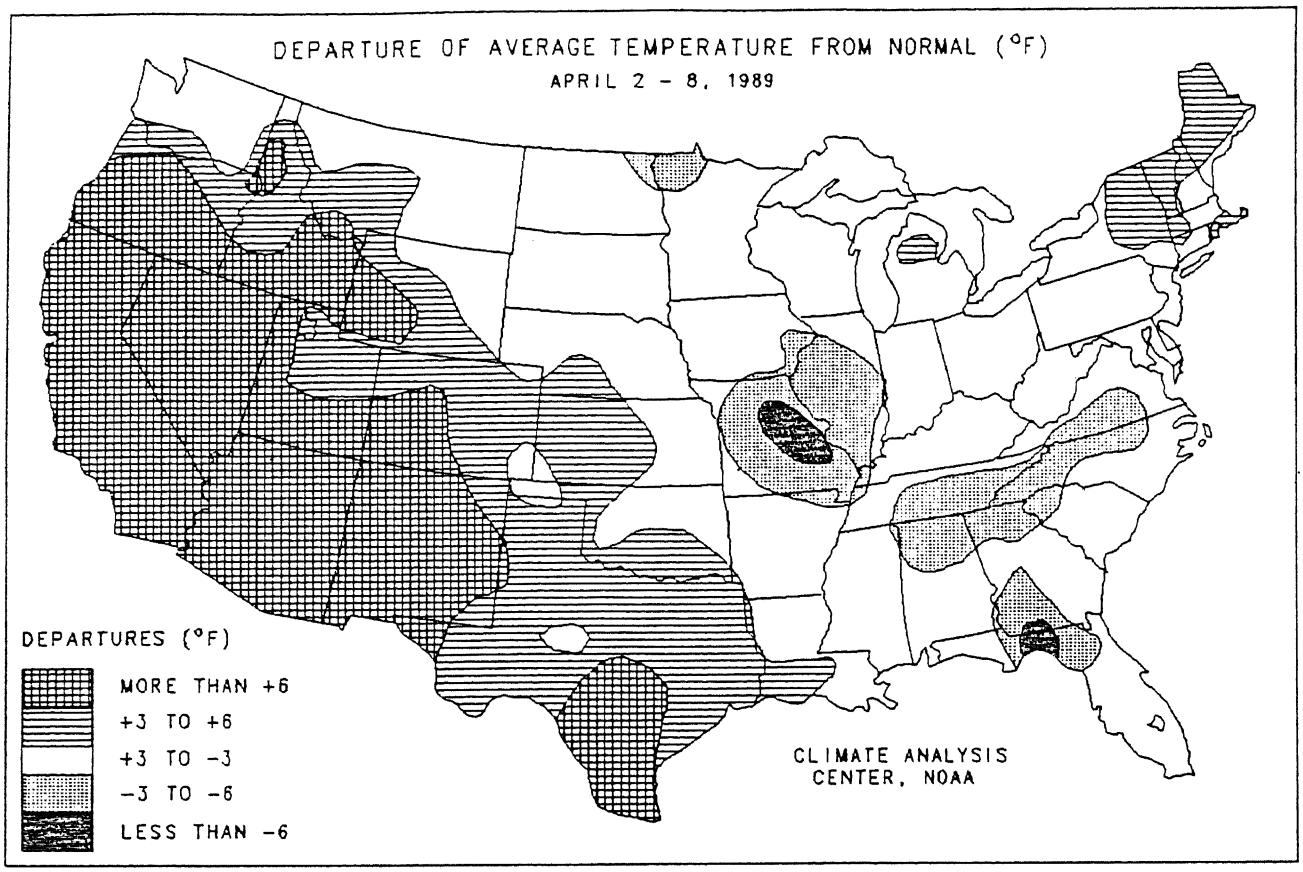
Unseasonably warm and dry conditions prevailed across the West last week while severe weather was a common occurrence in the South and East. A strong cold front entered the northern Great Plains on Monday and slowly moved eastward off the Atlantic Coast by the weekend. In the warm, unstable air preceding the front, numerous thunderstorms developed throughout the Midwest, Southeast, and mid-Atlantic. Heavy rains inundated the deep South, while large hail pelted the eastern sections of Texas, Arkansas, and Missouri and northeastern Illinois. Approximately one to two dozen tornadoes touched down from Texas eastward to South Carolina, most of which hit northern Georgia. Towards the end of the week, two intense low pressure centers developed along the front, dropping moderate amounts of rain along the northern two-thirds of the East Coast while blanketing the higher elevations of the Appalachians with light snow except in western North Carolina, where up to 14 inches fell. Snow also fell from the central Great Plains eastward to the western Great Lakes, in the central Rockies where parts of Colorado received over a foot, and in the north Great Plains. An upper-air ridge of high pressure centered over the West Coast steered most Pacific storm systems northeastward and kept most of the region dry and warm; however, portions of western Washington and the northern Cascades received moderate precipitation. Flooding occurred along the Red River in North Dakota and in parts of northern Vermont and New Hampshire due to the combination of rain and rapid snowmelt.

According to the River Forecast Centers, the heaviest precipitation (up to 6.2 inches) in the contiguous U.S. was observed in the Southeast, most notably in southern Tennessee and the northern halves of Alabama and Georgia, while the leeward side of the northern Cascades reported up to 5.9 inches of precipitation. Farther west, portions of the Hawaiian Islands were inundated with more than 10 inches of rain (see Table 1). Reports of two to four inches were common from central Illinois and Indiana southward to the central Gulf Coast, and along the Atlantic Coast from northeastern South Carolina northward into Maine. Light to moderate amounts occurred along the northern half of the Pacific Coast, in the northern halves of the Rockies and Plains, and throughout most of the country east of the Mississippi River. Little or no precipitation fell along the southern half of the Pacific Coast, on much of the Intermountain West, the southern thirds of the Rockies and Plains, in portions of Florida, and along the normally wet coast of southeastern Alaska, the latter area experiencing subnormal precipitation for the tenth consecutive week.

Abnormally warm weather prevailed throughout the western half of the country, while temperatures averaged slightly above normal in the Northeast due to mild conditions early in the week. The greatest positive departures (between +10° and +17°F) occurred in the Southwest, most notably in California, Nevada, and Arizona (see Table 2). Hot, dry easterly winds, commonly known as the Santa Ana winds, sent temperatures into the nineties and one hundreds at coastal California locations that are normally cooled by onshore ocean breezes (see front cover). Over 50 daily maximum temperature records were set during the week, and a few stations in the Southwest established all-time April and/or early season highs. Farther east, even portions of southern Texas observed highs exceeding 100°F (see Figure 1). In contrast, subnormal temperatures persisted from the upper Midwest southeastward to the eastern Gulf and southern Atlantic Coasts. The greatest negative departures (between -5° and -7°F) were found in the lower Missouri and middle Mississippi Valleys (see Table 3). In Alaska, mild conditions continued in the western third of the state while temperatures moderated in the eastern portions. Cloudiness and heavy rains kept weekly temperatures in Hawaii slightly below normal.

TABLE 1. Selected stations with more than 2.50 inches of precipitation for the week.

Station	Total(In)	Station	Total(In)
Hilo/Lyman, Hawaii, HI	10.49	Atlanta, GA	3.53
Kokee, Kauai, HI	9.73	Mt. Washington, NH	3.38
Kahalui, Maui, HI	8.03	Evansville, IN	3.26
Montgomery, AL	4.17	Columbus/Ft. Benning, GA	3.15
Columbus, GA	3.99	Crossville, TN	2.81
Newport News/Henry NDB, VA	3.79	Dover AFB, DE	2.79
Montgomery/Maxwell AFB, AL	3.71	Columbus AFB, MS	2.72
Cape Hatteras, NC	3.70	Athens, GA	2.66
Anniston, AL	3.66	Jackson, TN	2.65
Greenwood, MS	3.60	Brunswick NAS, ME	2.62
Quillayute, WA	3.60	Macon, GA	2.62
Louisville, KY	3.56	Huntsville, AL	2.59
Chattanooga, TN	3.55	Hopkinsville/Campbell AAF, KY	2.58


DEPARTURE OF AVERAGE TEMPERATURE FROM NORMAL (°F)
APRIL 2 - 8, 1989
DEPARTURES (°F)
MORE THAN +6
+3 TO +6
+3 TO -3
-3 TO -6
LESS THAN -6
CLIMATE ANALYSIS
CENTER, NOAA

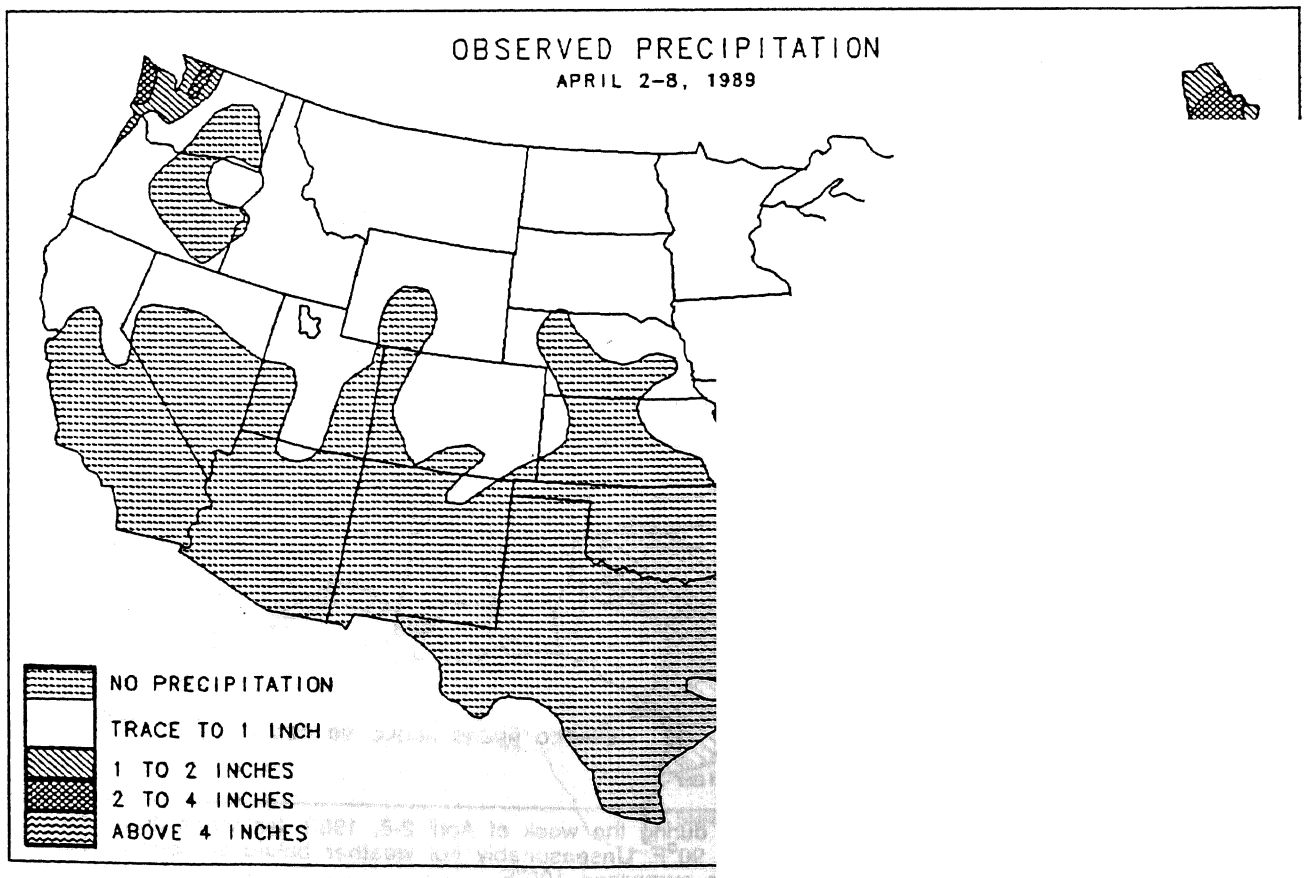

OBSERVED PRECIPITATION
APRIL 2-8, 1989
NO PRECIPITATION
TRACE TO 1 INCH
1 TO 2 INCHES
2 TO 4 INCHES
ABOVE 4 INCHES

TABLE 2. Selected stations with temperatures averaging 9.0°F or more ABOVE normal for the week.

Station	Degrees F Dep.	Avg.	Station	Degrees F Dep.	Avg.
Phoenix, AZ	+17.1	82.2	Sacramento, CA	+12.5	68.5
Los Angeles, CA	+16.8	75.7	Imperial, CA	+12.3	79.9
Glendale/Luke AFB, AZ	+15.9	80.6	Tucson, AZ	+12.3	74.5
Yuma, AZ	+15.8	84.1	Tucson/Davis-Monthan AFB,AZ	+11.8	73.8
Santa Barbara, CA	+15.5	71.6	Ely, NV	+11.5	49.4
Blythe, CA	+14.8	82.7	Lovelock, NV	+11.2	56.5
Prescott, AZ	+14.8	61.7	Fresno, CA	+10.7	68.4
Las Vegas, NV	+14.5	74.9	Deming, NM	+10.6	66.1
Thermal, CA	+13.8	81.6	Cedar City, UT	+10.4	54.3
Paso Robles, CA	+13.8	67.9	Douglas, AZ	+10.2	67.3
Reno, NV	+13.3	57.2	Bakersfield, CA	+ 9.9	70.2
San Diego/Lindbergh, CA	+13.2	73.2	Albuquerque, NM	+ 9.7	61.7
San Fransisco, CA	+13.0	66.9	Winnemucca, NV	+ 9.5	52.0
Barrow, AK	+13.0	5.0	Medford, OR	+ 9.1	57.3
Victorville/George AFB,CA	+12.7	68.0	Beeville NAS, TX	+ 9.0	77.8

TABLE 3. Selected stations with temperatures averaging more than 3.5°F BELOW normal for the week.

Station	Degrees F Dep.	Avg.	Station	Degrees F Dep.	Avg.
Decatur, IL	-6.7	43.0	Greenville, SC	-4.3	53.2
Columbia, MO	-6.5	44.8	Grand Forks, ND	-4.1	30.4
Tallahassee, FL	-5.6	59.0	Gainesville, FL	-4.0	63.7
Rolla, MO	-5.4	45.9	Asheville, NC	-3.8	48.9
Rome, GA	-5.4	53.4	Greensboro, NC	-3.8	51.1
Springfield, IL	-5.0	44.2	Danville, VA	-3.6	52.2
Poplar Bluff, MO	-5.0	50.9	Huntsville, AL	-3.6	54.7
St. Louis, MO	-4.7	47.3	Anderson, SC	-3.6	55.0
Warroad, MN	-4.5	28.2	Birmingham, AL	-3.6	56.3
Albany, GA	-4.5	60.1	Macon, GA	-3.6	58.8

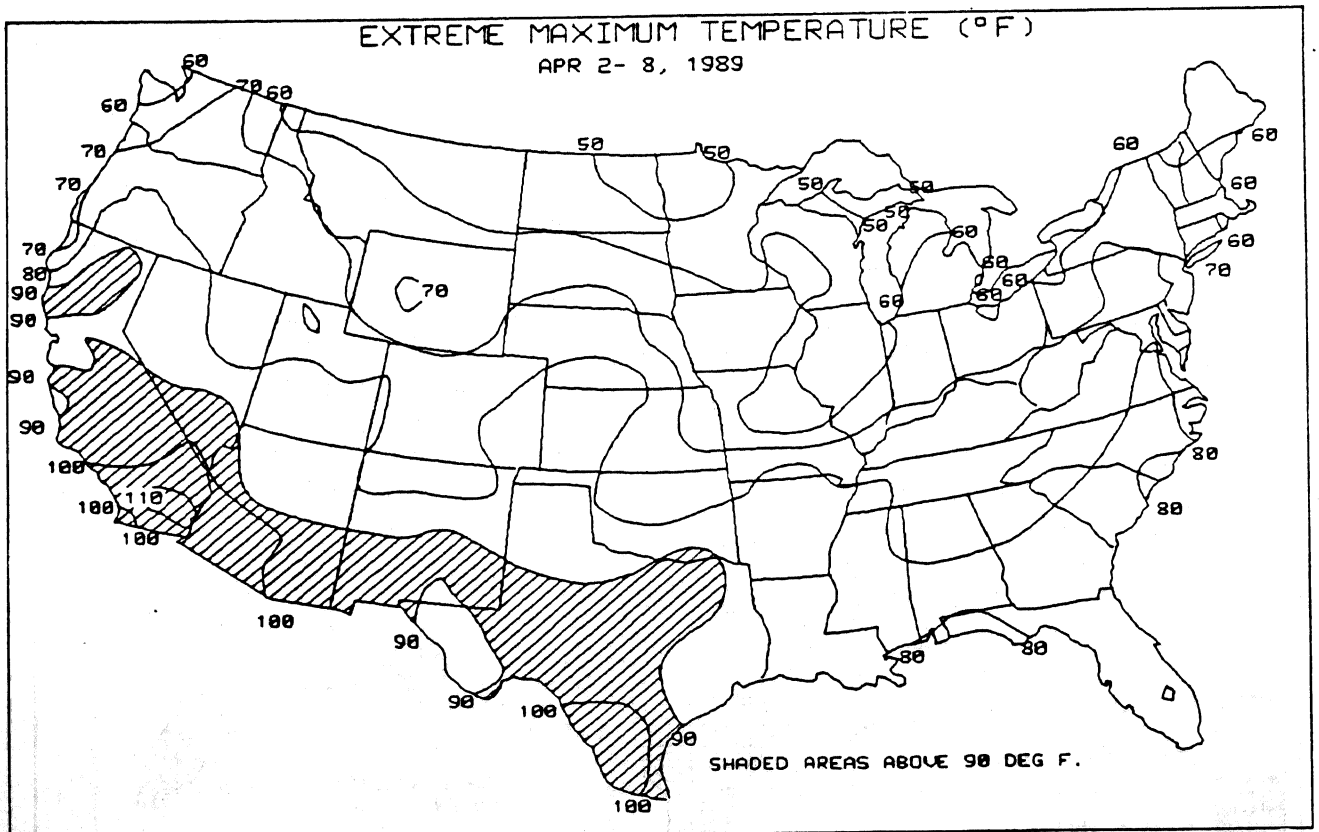
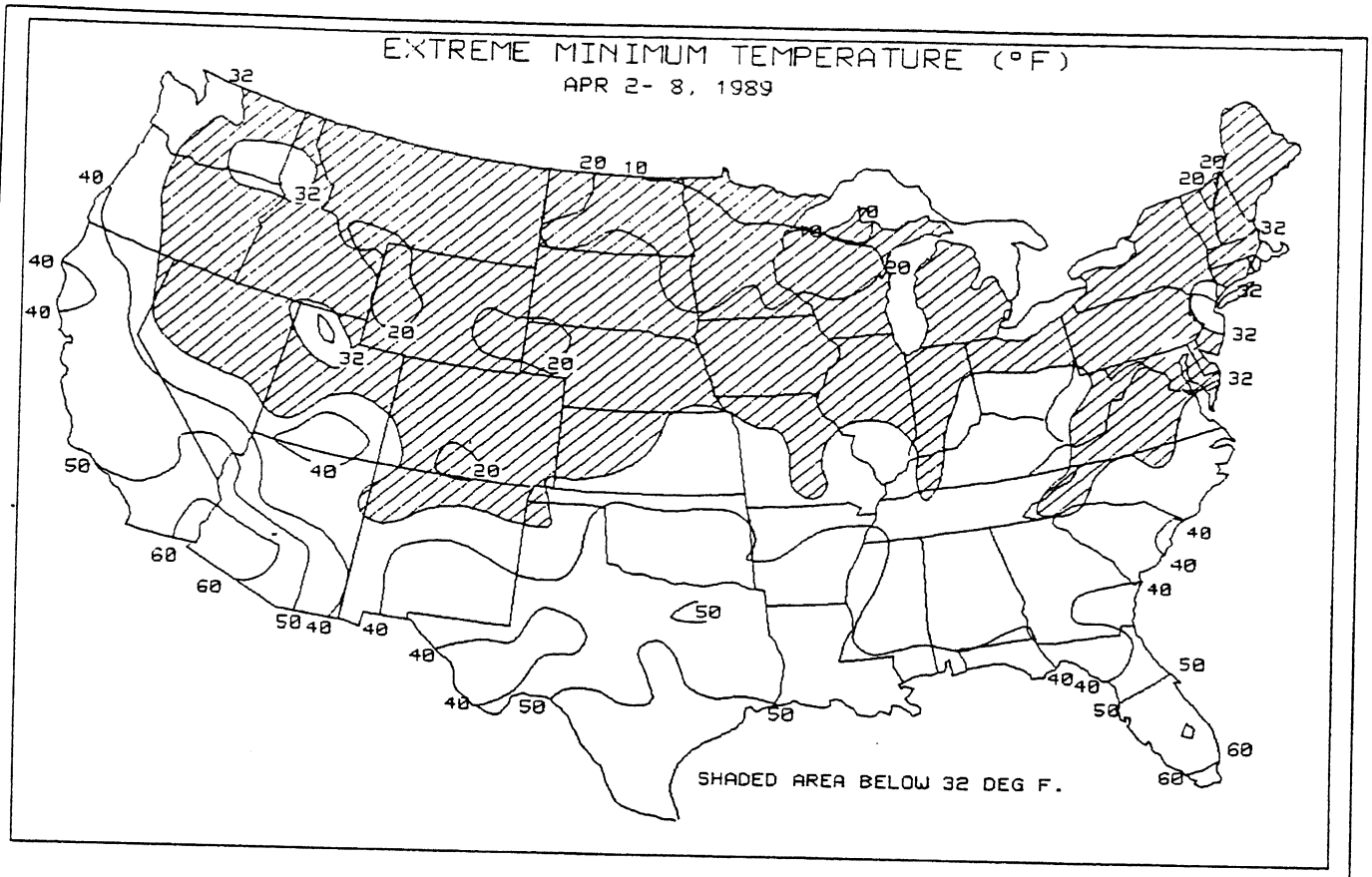
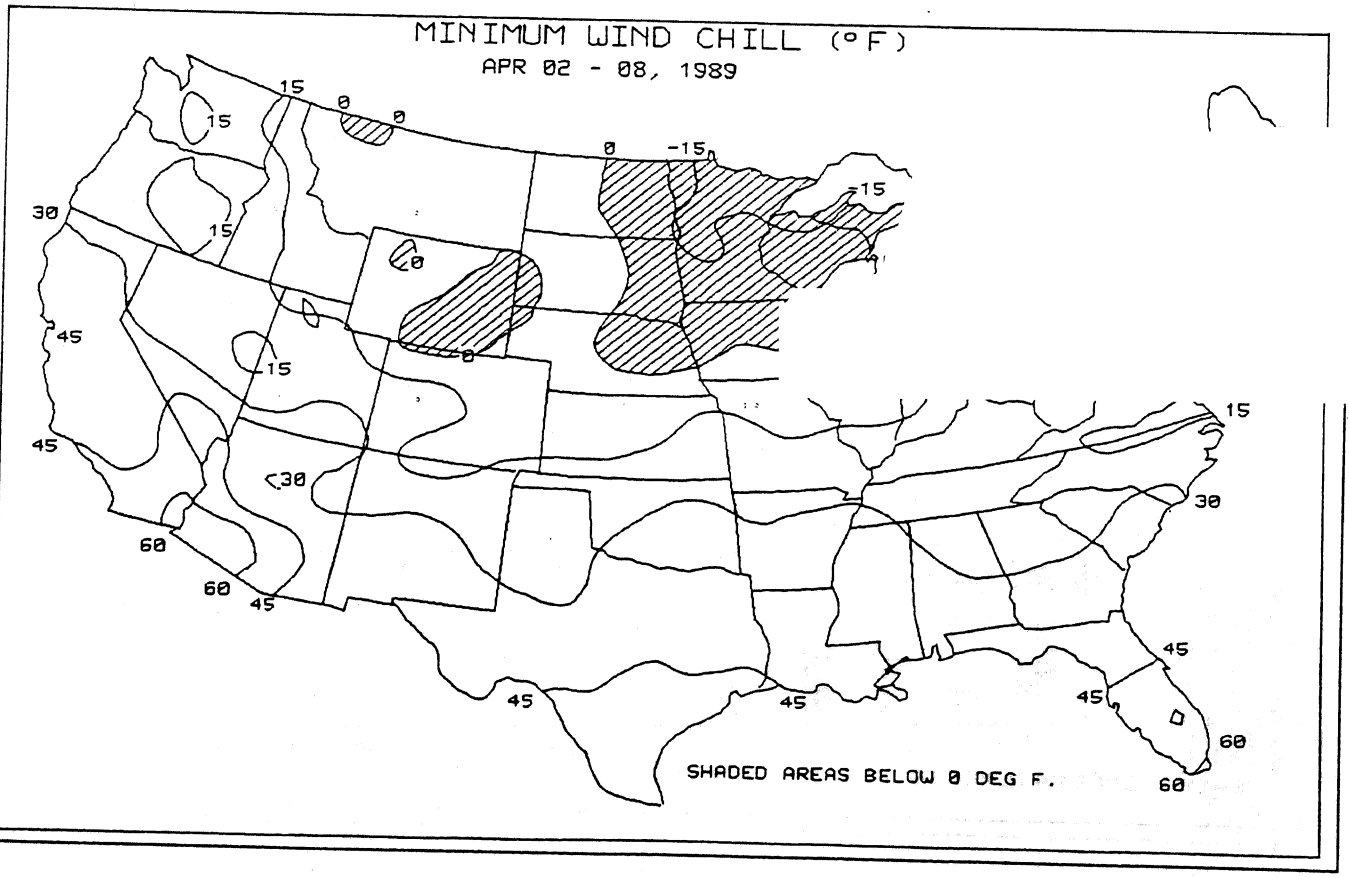
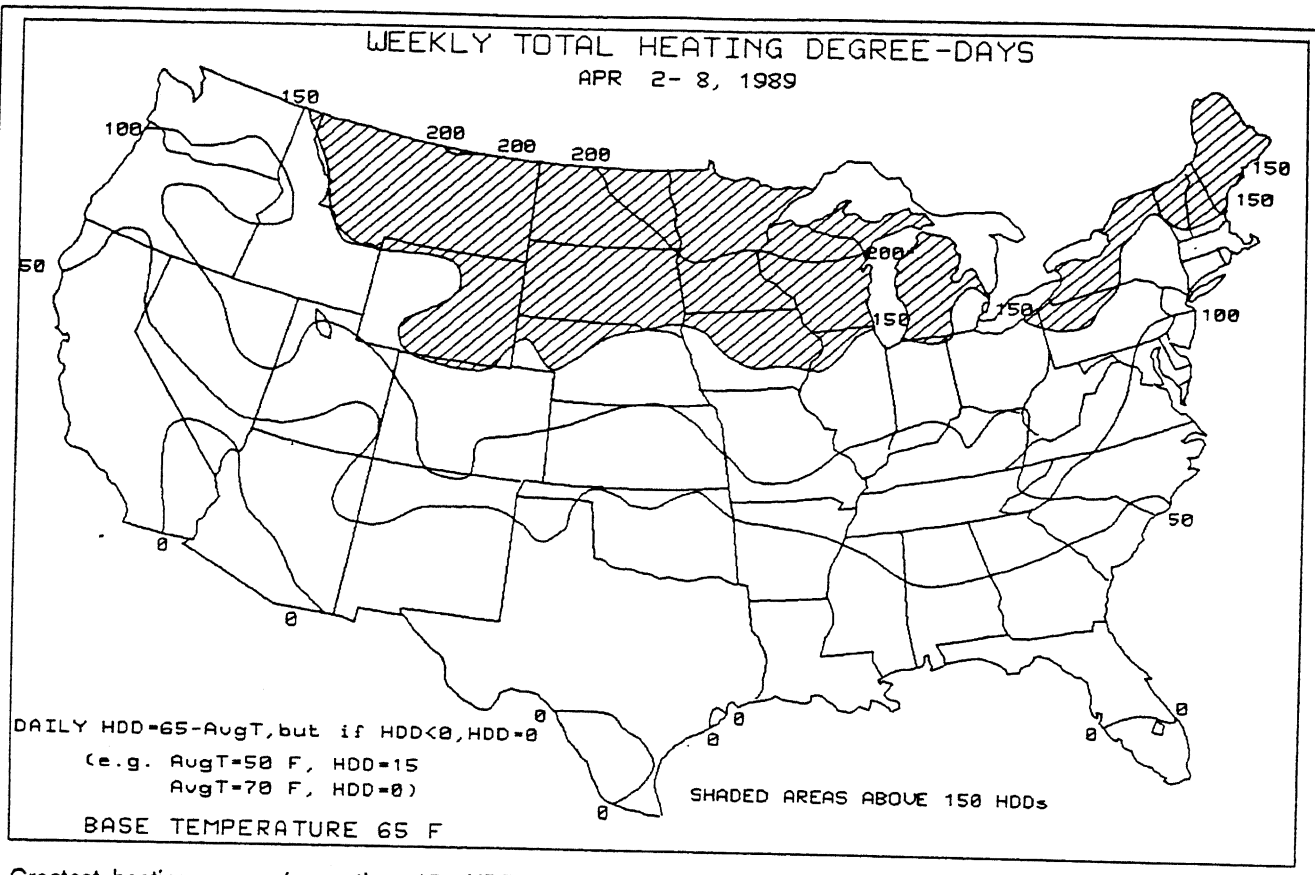


Figure 1. Extreme maximum temperatures (°F) during the week of April 2-8, 1989. Isotherms drawn for every 10°F, and shaded areas are greater than 90°F. Unseasonably hot weather baked sections of the Southwest, especially southern California as highs surpassed 100°F.

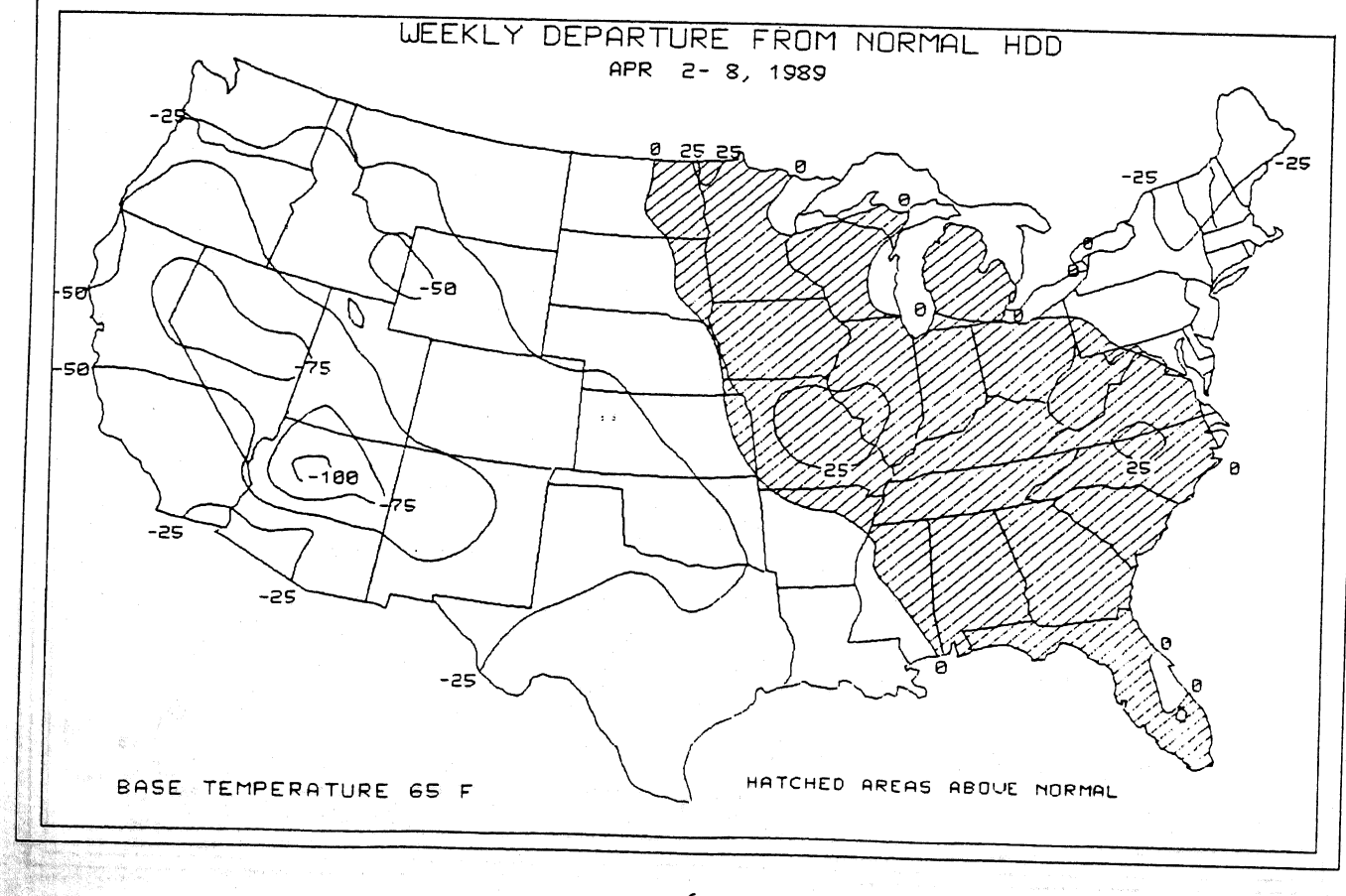


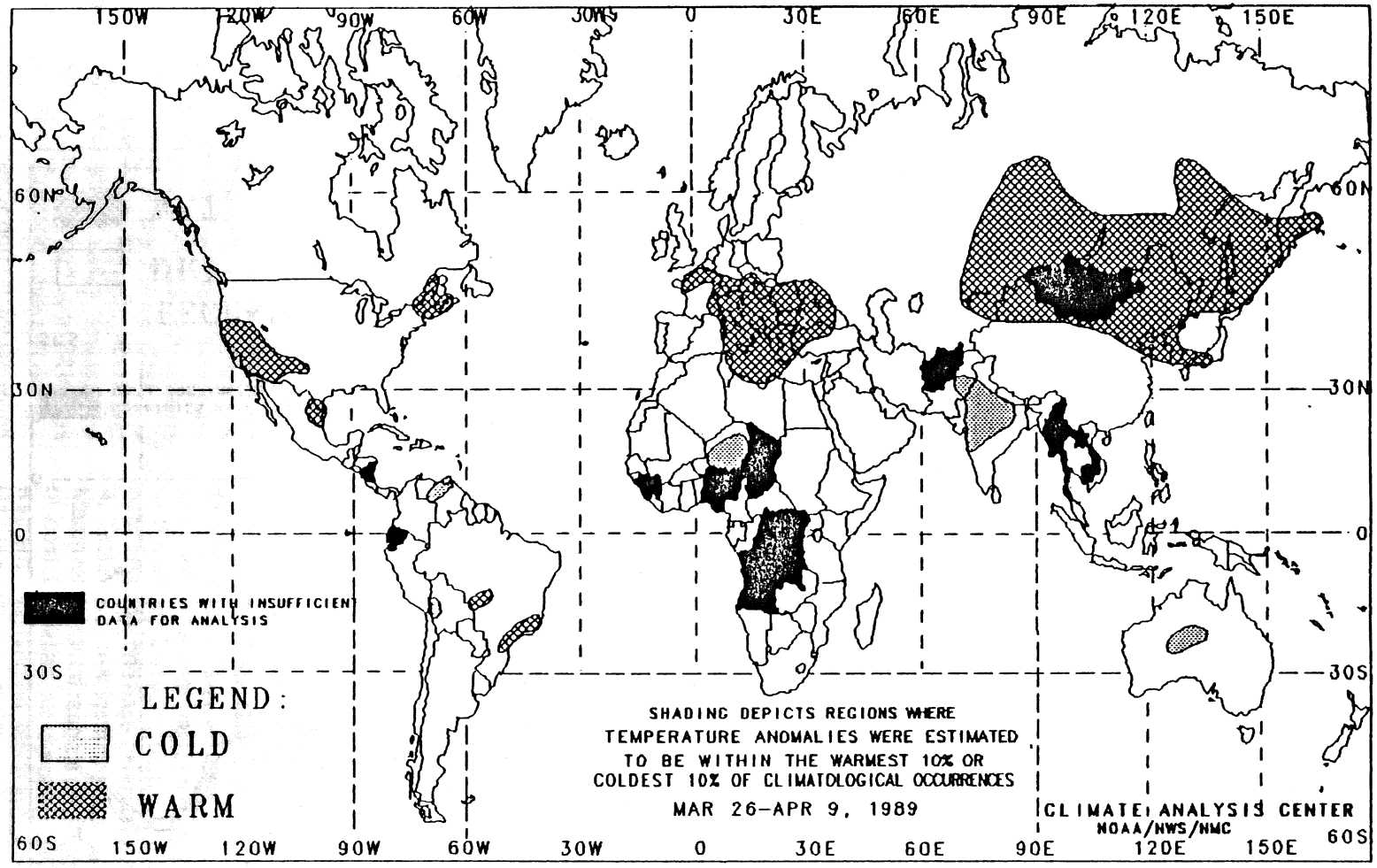
Cooler air returned to much of the eastern half of the U.S.; however, single-digit readings were limited to the upper Midwest (top). Gusty winds and colder weather created wind chills as low as -15°F in northern Minnesota (bottom).





Greatest heating usage (more than 150 HDD's) occured over the northern third of the country (top). Unseasonably warm conditions reduced the heating demand in the Southwest while colder weather increased the weekly heating demand in much of the eastern half of the country (bottom).





The anomalies on this chart are based on approximately 2500 observing stations for which at least 13 days of temperature observations were received from synoptic reports. Many stations do not operate on a twenty-four hour basis so many night time observations are not taken. As a result of these missing observations the estimated minimum temperature may have a warm bias. This in turn may have resulted in an overestimation of the extent of some warm anomalies.

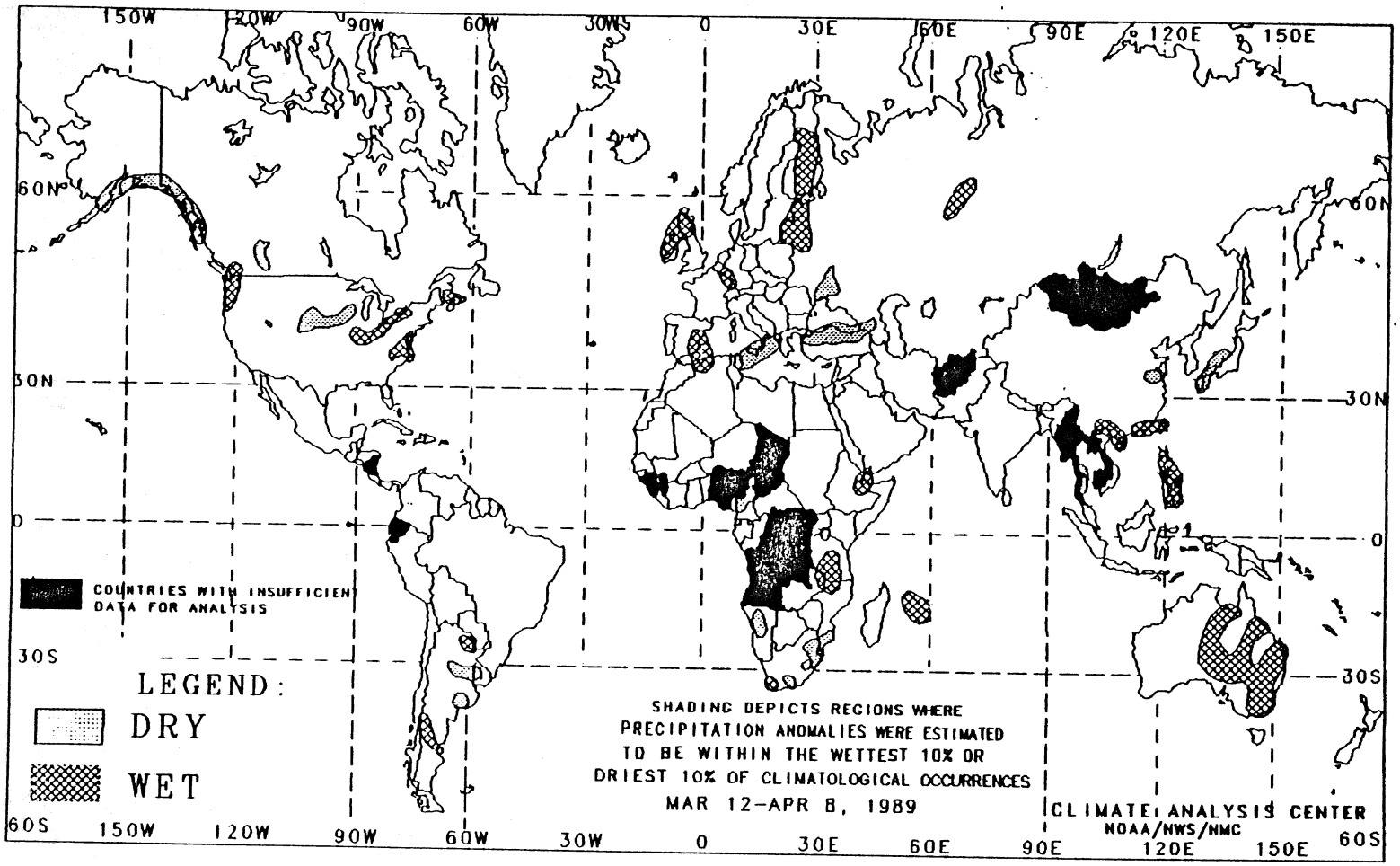
Temperature anomalies are not depicted unless the magnitute of temperature departures from normal exceeds 1.5°C.

In some regions, insufficient data exist to determine the magnitude of anomalies. These regions are located in parts of tropical Africa, southwestern Asia, interior equatorial South America, and along the Arctic Coast. Either current data are too sparse or incomplete for analysis, or historical data are insufficient for determining percentiles, or both. No attempt has been made to estimate the magnitude of anomalies in such regions.

This chart shows general areas of two week temperature anomalies. Caution must be used in relating it to local conditions, especially in mountainous regions.

GLOBAL PRECIPITATION ANOMALIES

4 WEEKS



The anomalies on this chart are based on approximately 2500 observing stations for which at least 27 days of precipitation observations (including zero amounts) were recieved or estimated from synoptic reports. As a result of both missing observations and the use of estimates from synoptic reports (which are conservative), a dry bias in the total precipitation amount may exist for some stations used in this analysis. This in turn may have resulted in an overestimation of the extent of some dry anomalies.

In climatologically arid regions where normal precipitation for the four week period is less than 20 mm, dry anomalies are not depicted. Additionally, wet anomalies for such arid regions are not depicted unless the total four week precipitation exceeds 50 mm.

In some regions, insufficient data exist to determine the magnitude of anomalies. These regions are located in parts of tropical Africa, southwestern Asia, interior equatorial South Africa, and along the Arctic Coast. Either current data are too sparse or incomplete for analysis, or historical data are insufficient for determining percentiles, or both. No attempt has been made to estimate the magnitude of anomalies in such regions.

The chart shows general areas of four week predipitation anomalies. Caution must be used in relating it to local conditions, especially in mountainous regions.

UNITED STATES MONTHLY CLIMATE SUMMARY

MARCH 1989

Generally zonal (west to east) flow across the United States favored frequent, fast-moving storms during March. In the eastern half of the nation, occasional southward and northward dips of the jet stream interspersed wintry conditions with summer-like weather. The large contrast in conditions contributed to several outbreaks of severe weather that included tornadoes, most notably in the southern Plains early in the month and to parts of the South and the East from Arkansas to Delaware near the end of March. Wintry conditions occurred in sections of the southern and eastern U.S. in response to a storm system that moved northeastward along the Atlantic Coast, glazing portions of the area with snow, freezing rain, and sleet early in March. As the month progressed, heavy snow fell on areas of the south-central Plains while a late season snowstorm blanketed much of the Ohio Valley and the eastern Great Lakes. Although temperatures were highly variable, two significant cold air masses infiltrated the eastern two-thirds of the U.S. Early in the month, unseasonably cold air brought freezing temperatures to southern Texas and the western Gulf Coast. A second blast of cold Canadian air invaded the northern Great Plains, upper Midwest, mid-Atlantic, and New England around the third week of March. Both cold regimes, however, were followed by warm spells. In contrast, the Southwest experienced unusually warm weather throughout most of the month.

Above normal precipitation was observed across much of the northwestern, northern, southern, and east-central United States (see Figures 1 and 2, Table 1). Abundant precipitation was reported along the Atlantic Coast from North Carolina to southern New Jersey, and frequent storms brought surplus amounts to parts of the southern Great Plains, the middle Mississippi, western Tennessee, and Ohio Valleys, and the eastern Great Lakes. The first significant precipitation since last September was observed in eastern Kansas, providing some relief from long-term dryness. Wet weather prevailed in the Pacific Northwest during March; however, significant long-term precipitation deficits remained. Excessive precipitation fell on the central Appalachian Mountains during the first half of the month while the Southeast experienced their heaviest rains in early and late March. According to the River Forecast Centers, the greatest monthly totals (between 8 and 23 inches) were found along the northern half of the Pacific Coast, at stations in the Cascade and Sierra Nevada Mountains, and in parts of the lower Mississippi Valley. Towards the end of the month, torrential rains dropped up to 22 inches of rain on northeastern Texas, creating severe flooding.

March precipitation was below normal across much of the central United States from the High Plains of Wyoming and Colorado eastward to southern Michigan and northwestern Ohio (see Figures 1 and 2, Table 2). Additionally, subnormal amounts were recorded at stations in the desert Southwest, the southern half of the Rockies, and in portions of the Southeast, particularly in the southern Appalachians, northern Mississippi, and along the eastern Gulf and southern Atlantic Coasts. Precipitation increased in New England after an extremely dry Winter, however, March totals were generally below normal. Farther north, unusually dry weather persisted along Alaska's southeastern coast as most stations received only 25-50% of the normal March precipitation. Regionally, most areas had mid-range rankings with the exception of the Northwest (WA, OR, ID) and Southwest (UT, CO, AZ, NM) regions that recorded the third wettest and ninth driest March during the past 95 years, respectively. Overall, precipitation in the lower 48 states was slightly above the long-term average (see Figure 5); however, the nation has been slow to recover from last year's drought as nearly 30% of the contiguous U.S. was experiencing severe or extreme long-term drought at the end of March (see Figure 7).

Most of the southern two-thirds of the United States reported above normal monthly temperatures. Highest positive temperature departures (approaching +10°F) occurred throughout the Southwest and in sections of the central Rockies (see Figures 3 and 4, Table 3). Farther east, March temperatures averaged slightly above normal in the lower Midwest, Southeast, and mid-Atlantic even with the intrusion of two cold outbreaks. In Alaska, mild weather persisted across the western and northern portions of the state as temperatures averaged up to 9°F above normal. Individually, many stations established new extreme maximum March temperature records as readings in the eighties occurred as far north as Nebraska, Iowa, Pennsylvania, and Massachusetts (see Table 7). Regionally, the Southwest (UT, CO, AZ, NM) and the West (CA, NV) observed the third and seventh warmest March since 1895, respectively, while the national March temperature averaged just slightly above the long-term mean (see Figure 6).

In contrast, below normal temperatures covered much of the northern tier of states from Washington to Maine and in eastern Alaska. Greatest negative departures from normal (between -4° and -6°F) occurred in the upper Midwest, upper Missouri Valley, northern New England, and east- central Alaska (see Figures 3 and 4, Table 4). A few locations set new extreme minimum March temperature records (see Table 7) as the incursion of cold Canadian air dropped lows into the teens in western Washington while subzero readings (-35°F at Hibbing, MN on 3/2/89) were observed across the northern Rockies, the northern Great Plains, upper Midwest, and northern New England.

TABLE 1. MARCH STATIONS WITH MORE THAN 150% OF NORMAL PRECIPITATION AND MORE THAN FOUR INCHES OF PRECIPITATION; OR, STATIONS WITH MORE THAN SEVEN INCHES OF PRECIPITATION AND NO NORMALS.

STATION	TOTAL (INCHES)	PCT. OF NORMAL	STATION	TOTAL (INCHES)	PCT. OF NORMAL
Longview/Gregg County, TX	15.64	419.3	Salisbury, MD	6.66	163.2
North Bend, OR	13.36	177.2	Hampton/Langley AFB, VA	6.59	154.8
Kokee, Kauai, HI	11.65	170.8	Dover AFB, DE	6.53	162.4
Haterras, NC	11.19	283.3	Salem, OR	6.47	150.7
Redding, CA	10.94	220.6	Patuxent River NAS, MD	6.46	192.4
Eugene, OR	10.93	214.5	Cincinnati, OH	6.40	162.9
Little Rock, AR	8.68	186.1	Sacramento, CA	6.22	304.4
Lihue, Kauai, HI	8.62	191.8	Dayton, OH	5.99	195.8
Norfolk, VA	8.50	221.7	Fort Smith, AR	5.99	155.2
Columbus/Ft. Benning, GA	8.43	***	Seattle-Tacoma, WA	5.79	162.3
Norfolk/NAS Chamber, VA	7.88	***	Morgantown, WV	5.74	158.9
Olympia, WA	7.87	162.2	Parkersburg/Wood County, VA	5.52	155.4
Eureka, CA	7.63	151.8	Pittsburgh, PA	5.52	154.9
Marysville/Beale AFB, CA	7.54	***	Lake Charles, LA	4.98	158.3
New Orleans/Moisant, LA	7.15	151.7	Red Bluff, CA	4.96	208.8
Portland, OR	6.73	187.4	Erie, PA	4.70	164.5
Wilmington, NC	6.70	165.9	San Francisco, CA	4.00	152.6

(Note: Stations without precipitation normals are indicated by asterisks.)

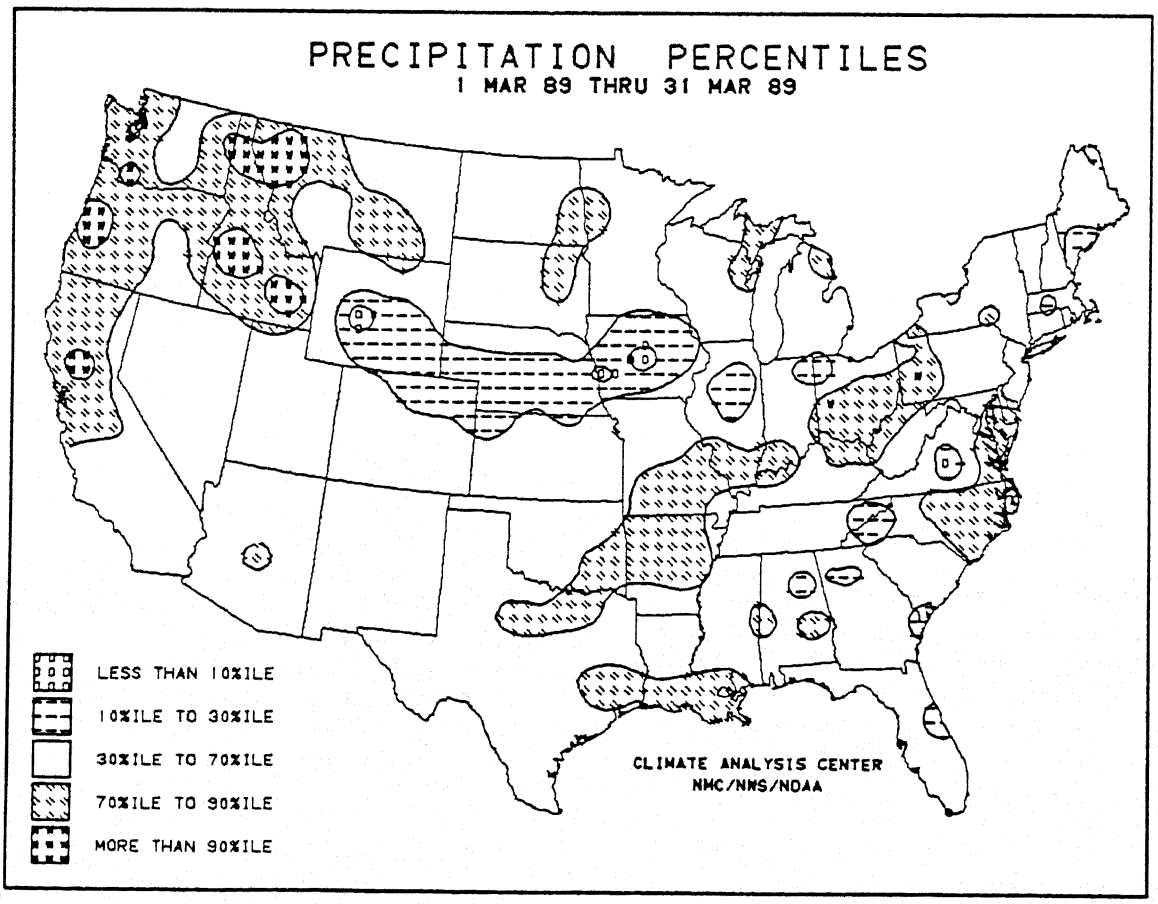


Figure 1. Precipitation percentiles during March 1989. Statistically significant precipitation (more than 70th percentile) fell on much of the Pacific Northwest, the middle Mississippi and Ohio Valleys, and along the western Gulf and middle Atlantic Coasts. In contrast, unusually dry conditions (less than 30th percentile) was observed from Wyoming eastward to Ohio.

TABLE 2. MARCH STATIONS WITH LESS THAN 50% OF NORMAL PRECIPITATION AND MORE THAN THREE INCHES OF NORMAL PRECIPITATION.

STATION	TOTAL (INCHES)	PCT. OF NORMAL	NORMAL (INCHES)	STATION	TOTAL (INCHES)	PCT. OF NORMAL	NORMAL (INCHES)
Rumford, ME	0.63	18.3	3.44	Valdez, AK	1.49	34.7	4.29
Juneau, AK	0.96	28.9	3.32	Cordova/Mile 13, AK	1.88	34.4	5.46
Quincy, IL	1.16	36.8	3.15	Sitka, AK	2.30	32.4	7.09
Worcester, MA	1.22	29.3	4.16	Annette Island, AK	2.65	29.1	9.09
Brunswick, GA	1.27	34.5	3.68	Adak, AK	2.82	48.2	5.85
Orlando, FL	1.35	41.2	3.28	Greenwood, MS	2.83	45.5	6.22
Savannah, GA	1.41	36.8	3.83	Yakutat, AK	3.35	35.1	9.55

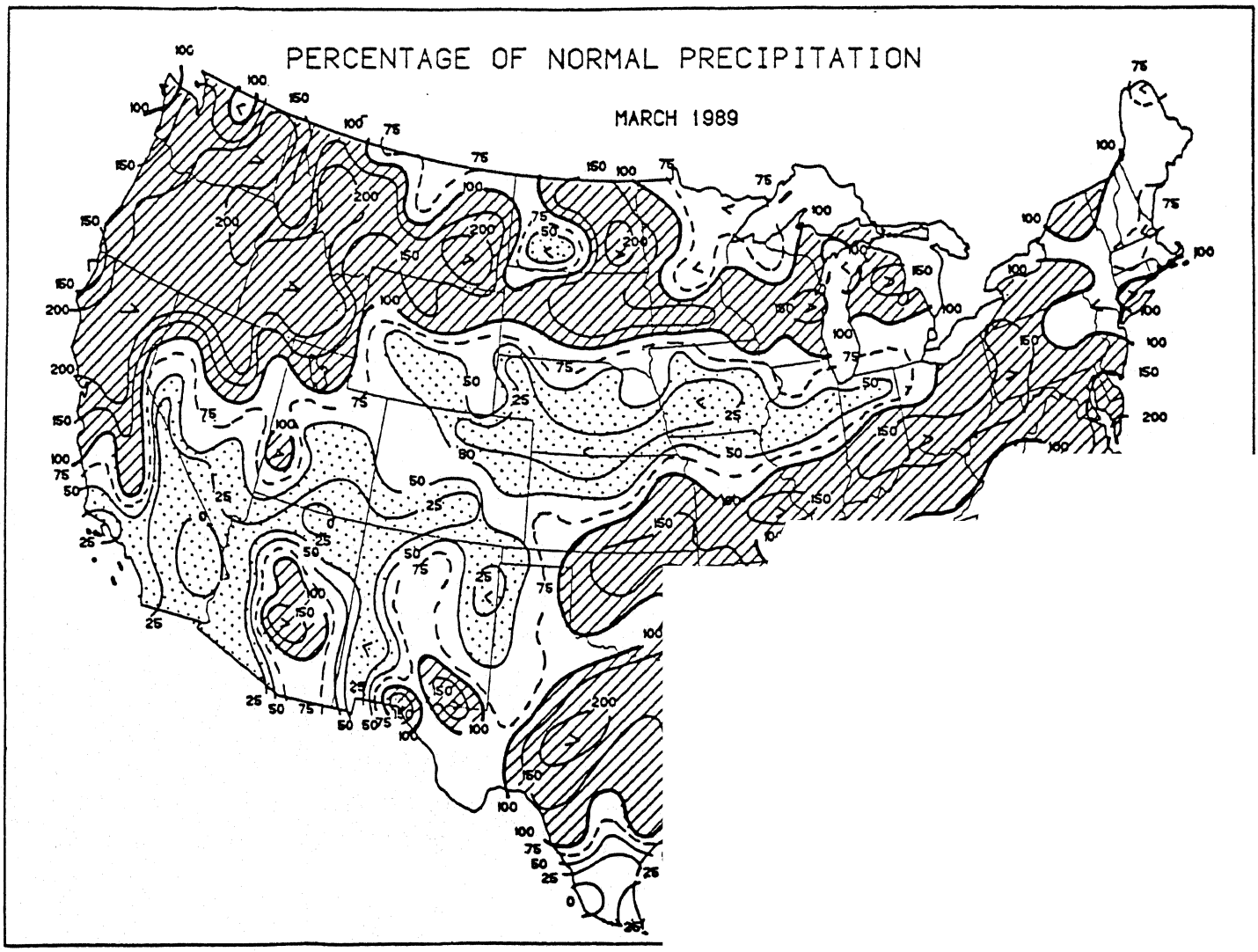


Figure 2. Percent of normal precipitation during March 1989. I
the southern Great Plains, Ohio Valley, and mid-Atlantic wh
and across the central Plains and western Corn Belt.

TABLE 3. MARCH AVERAGE TEMPERATURES MORE THAN 5.0°F ABOVE NORMAL.

STATION	DEPARTURE (°F)	AVERAGE (°F)	STATION	DEPARTURE (°F)	AVERAGE (°F)
Phoenix, AZ	+9.5	70.2	Reno, NV	+6.2	46.8
Prescott, AZ	+8.4	51.2	Victorville/George AFB, CA	+6.1	56.5
Trinidad, CO	+8.3	48.0	Douglas, AZ	+6.0	58.6
Ely, NV	+8.1	41.5	Roswell, NM	+6.0	56.9
Tucson/Davis-Monthan AFB, AZ	+8.0	65.7	Rock Springs/Sweetwater, WY	+6.0	35.8
Las Vegas, NV	+7.9	63.3	Elko, NV	+5.9	41.8
Colorado Springs, CO	+7.9	44.1	Kotzebue, AK	+5.9	5.7
Glendale/Luke AFB, AZ	+7.6	67.7	Clovis/Cannon AFB, NM	+5.8	52.4
Barrow, AK	+7.4	-8.3	Grand Junction, CO	+5.8	47.5
Tuscon, AZ	+7.2	64.9	Pueblo, CO	+5.8	46.2
Flagstaff, AZ	+7.2	41.7	Thermal, CA	+5.5	69.0
Laramie, WY	+7.2	34.6	Crossville, TN	+5.5	50.4
Tucumcari, NM	+7.0	54.6	Denver, CO	+5.4	43.3
Delta, UT	+7.0	46.4	Cheyenne, WY	+5.4	37.4
Farmington, NM	+6.9	47.7	Alamosa, CO	+5.4	37.2
Cedar City, UT	+6.9	46.1	Bethel, AK	+5.4	16.5
St. Paul Island, AK	+6.8	30.6	Salt Lake City, UT	+5.2	45.9
Yuma, AZ	+6.7	70.9	Winnemucca, NV	+5.2	43.9
Nome, AK	+6.7	13.5	Akron, CO	+5.2	40.6
Albuquerque, NM	+6.5	52.9	Imperial, CA	+5.1	68.9
Winslow, AZ	+6.5	51.6	Blythe, CA	+5.0	68.3
Lander, WY	+6.5	38.5	Deming, NM	+5.0	56.1

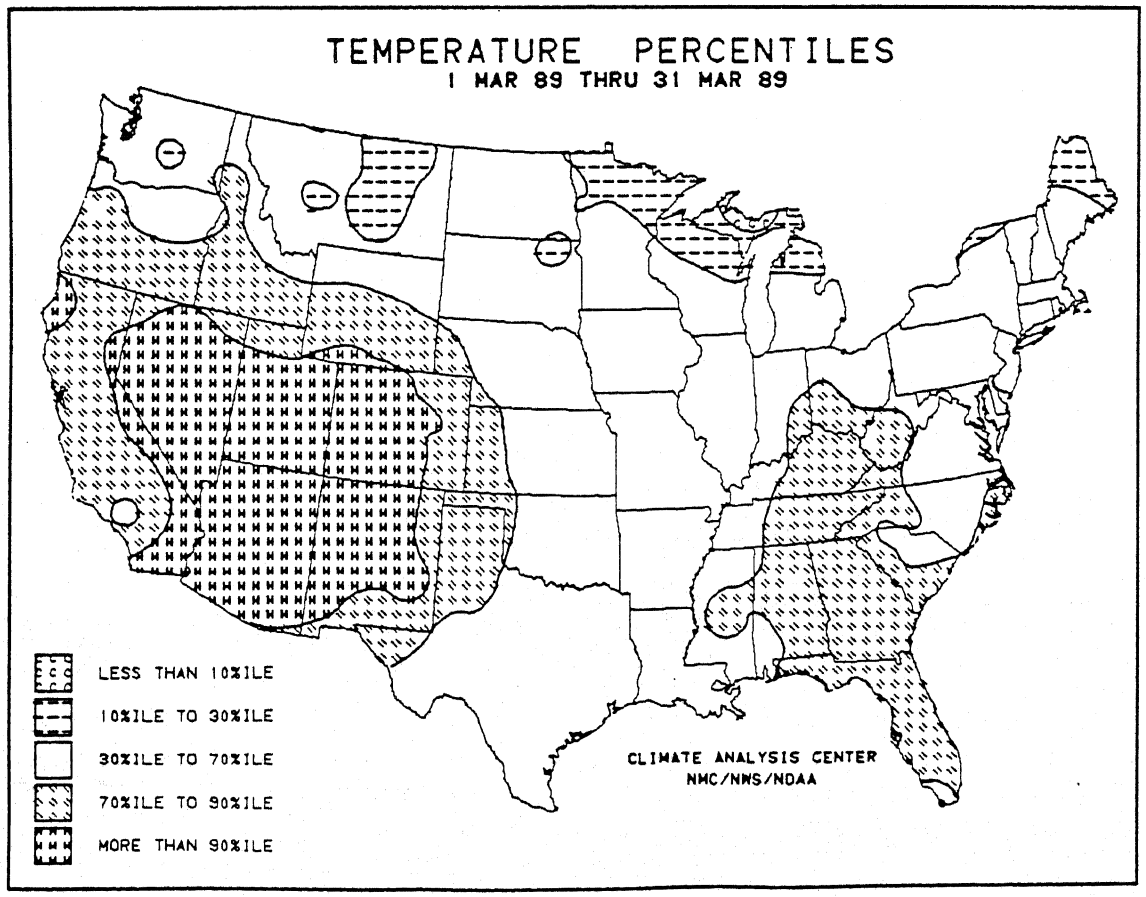


Figure 3. Temperature percentiles during March 1989. Statistically significant warmth persisted in the Southwest as this year's March temperatures were in at least the top ten percent of historical occurrences. In contrast, very few areas of the contiguous U.S. experienced monthly temperatures in the lower thirty percent.

ABLE 4. MARCH AVERAGE TEMPERATURES MORE THAN 3.0°F BELOW NORMAL.

TATION	DEPARTURE (°F)	AVERAGE (°F)	STATION	DEPARTURE (°F)	AVERAGE (°F)
scenaba, MI	-6.0	20.4	Fargo, ND	-4.1	20.1
g Delta, AK	-5.9	6.0	Park Falls, WI	-4.1	21.6
orthway, AK	-5.2	1.4	Havre, MT	-4.1	25.2
rand Forks, ND	-5.1	17.0	Helena, MT	-4.1	27.7
ut Bank, MT	-4.9	22.4	Billings, MT	-4.0	29.8
lasgow, MT	-4.9	22.8	Wenatchee, WA	-3.9	38.7
uluth, MN	-4.7	18.9	International Falls, MN	-3.8	16.8
ault Ste. Marie, MI	-4.7	19.4	Marquette, MI	-3.8	19.4
berdeen, SD	-4.7	22.8	Alpena, MI	-3.8	23.9
assena, NY	-4.6	23.6	Green Bay, WI	-3.6	25.2
ulkana, AK	-4.5	9.5	Pierre, SD	-3.6	27.7
aribou, ME	-4.5	19.9	Hancock, MI	-3.3	19.9
liles City, MT	-4.5	26.8	Augusta, ME	-3.1	28.4
/alla Walla, WA	-4.4	41.6			

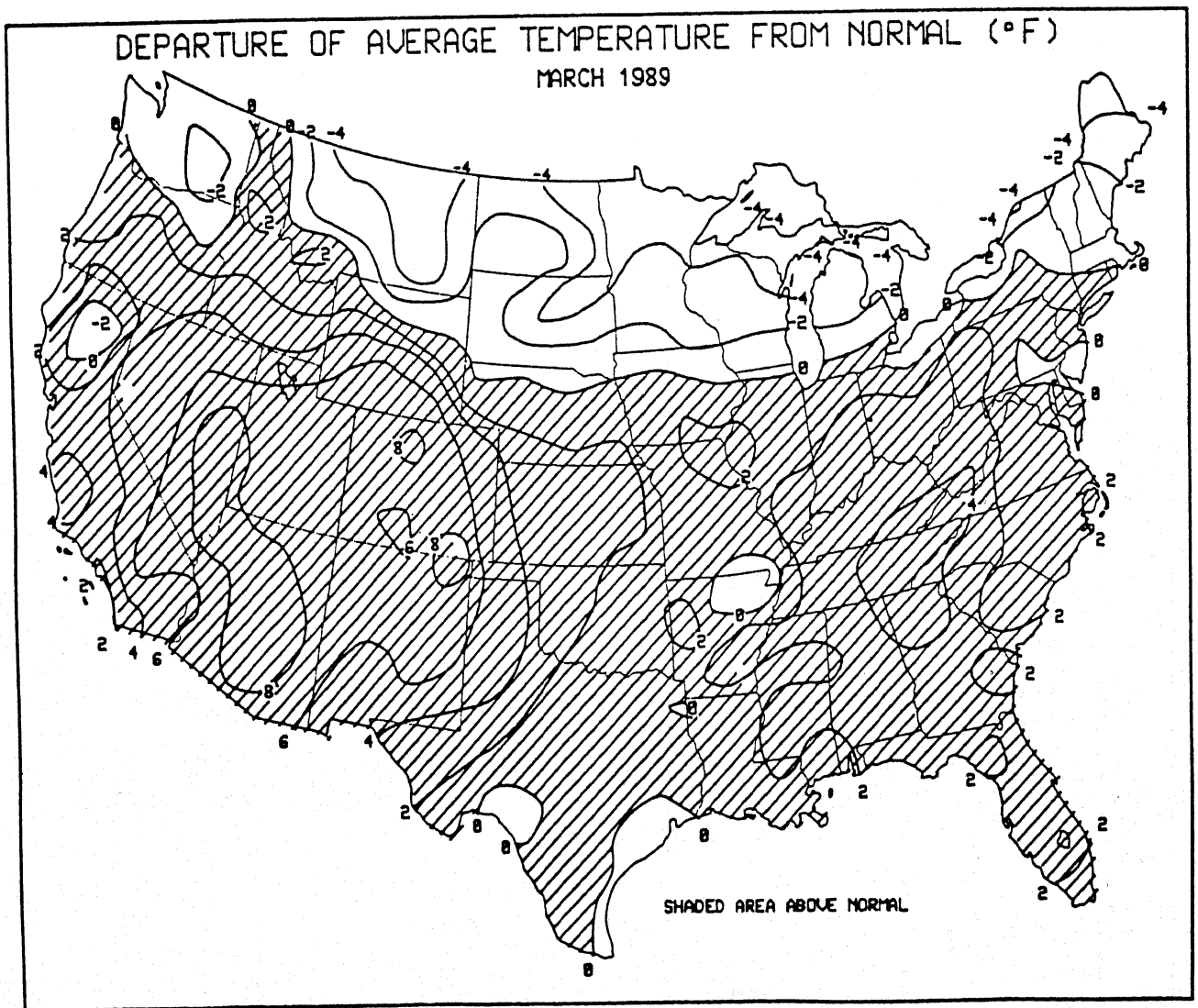


Figure 4. Temperature departure from normal (°F) during March 1989. Isotherms are drawn for every 2°F, and shaded areas are above normal. Most of the southern two-thirds of the U.S. experienced mild conditions, especially the Southwest as temperatures averaged up to 10°F above normal. The exception to this included the northern tier of states as the greatest negative departures were less than -4°F.

TABLE 5. RECORD MARCH TOTAL PRECIPITATION.

STATION	TOTAL (INCHES)	NORMAL (INCHES)	PCT. OF NORMAL	RECORD TYPE	RECORDS BEGAN
Norfolk, VA	8.50	3.83	221.9	HIGHEST	1947
Pocatello, ID	2.94	0.92	319.6	HIGHEST	1947
Missoula, MT	2.10	0.81	259.3	HIGHEST	1947
Lander, WY	0.13	1.11	11.7	LOWEST	1947
Homer, AK	0.03	1.29	2.3	LOWEST	1951
Pueblo, CO	Trace	0.65	0.0	LOWEST	1947
Gulkana, AK	0.00	0.34	0.0	LOWEST	1951

TABLE 6. RECORD MARCH AVERAGE TEMPERATURES.

STATION	AVERAGE (°F)	NORMAL (°F)	DEPARTURE (°F)	RECORD TYPE	RECORDS BEGAN
Tuscon, AZ	64.9	57.7	+7.2	HIGHEST	1947
Las Vegas, NV	63.3	55.4	+7.9	HIGHEST	1937
Colorado Springs, CO	44.1	36.2	+7.9	HIGHEST	1951
Ely, NV	41.5	33.4	+8.1	HIGHEST	1947

TABLE 7. RECORD MARCH EXTREME TEMPERATURES.

STATION	EXTREME (°F)	DATE	RECORD TYPE	RECORDS BEGAN
Corpus Christi, TX	102	30 MAR 89	HIGHEST	1939
Yuma, AZ	98	31 MAR 89	HIGHEST	1949
Victoria, TX	97	30 MAR 89	HIGHEST	1961
Midland, TX	95	12 MAR 89	HIGHEST	1949
Lubbock, TX	95	11 MAR 89	HIGHEST	1947
Roswell, NM	93	12 MAR 89	HIGHEST	1973
Dodge City, KS	93	10 MAR 89	HIGHEST	1941
Houston, TX	91	30 MAR 89	HIGHEST	1970
El Paso, TX	89	12 MAR 89	HIGHEST	1939
Wichita, KS	89	11 MAR 89	HIGHEST	1954
Huntington, WV	86	28 MAR 89	HIGHEST	1962
Beckley, WV	81	28 MAR 89	HIGHEST	1963
New York/LaGuardia, NY	81	28 MAR 89	HIGHEST	1941
Boston, MA	81	28 MAR 89	HIGHEST	1936
Providence, RI	80	28 MAR 89	HIGHEST	1954
Lansing, MI	78	27 MAR 89	HIGHEST	1949
Flint, MI	78	27 MAR 89	HIGHEST	1942
Alpena, MI	74	27 MAR 89	HIGHEST	1960
Bridgeport, CT	74	29 MAR 89	HIGHEST	1948
Brownsville, TX	32	7 MAR 89	LOWEST	1937
Lake Charles, LA	25	6 MAR 89	LOWEST	1962
Portland, OR	19	3 MAR 89	LOWEST	1941
Quillayute, WA	19	3 MAR 89	LOWEST	1966
Wichita Falls, TX	8	6 MAR 89	LOWEST	1943
Spokane, WA	-7	3 MAR 89	LOWEST	1948
Billings, MT	-19	4 MAR 89	LOWEST	1935
Marquette, MI	-26	2 MAR 89	LOWEST	1979
Duluth, MN	-29	2 MAR 89	LOWEST	1941

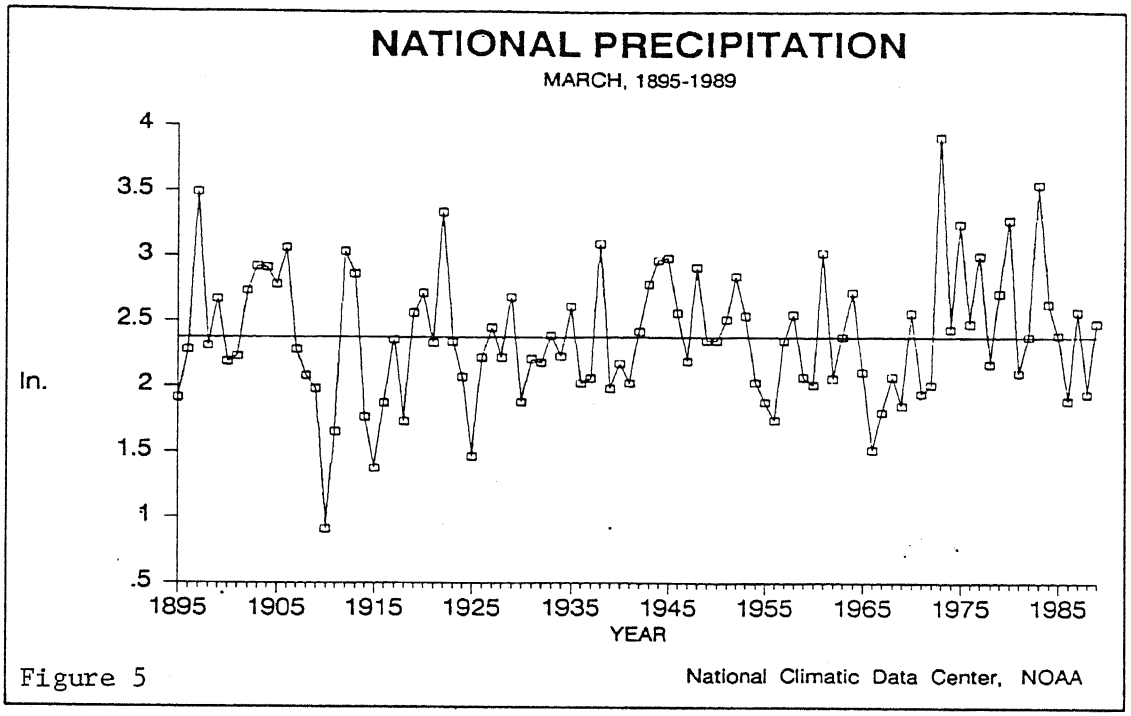


Figure 5 National Climatic Data Center, NOAA

National average precipitation (inches) and average temperature (°F) for March 1989 obtained from the NOAA's National Climatic Data Center (NCDC). Both the nationally averaged precipitation (top) and temperature (bottom) were slightly above the long-term means.

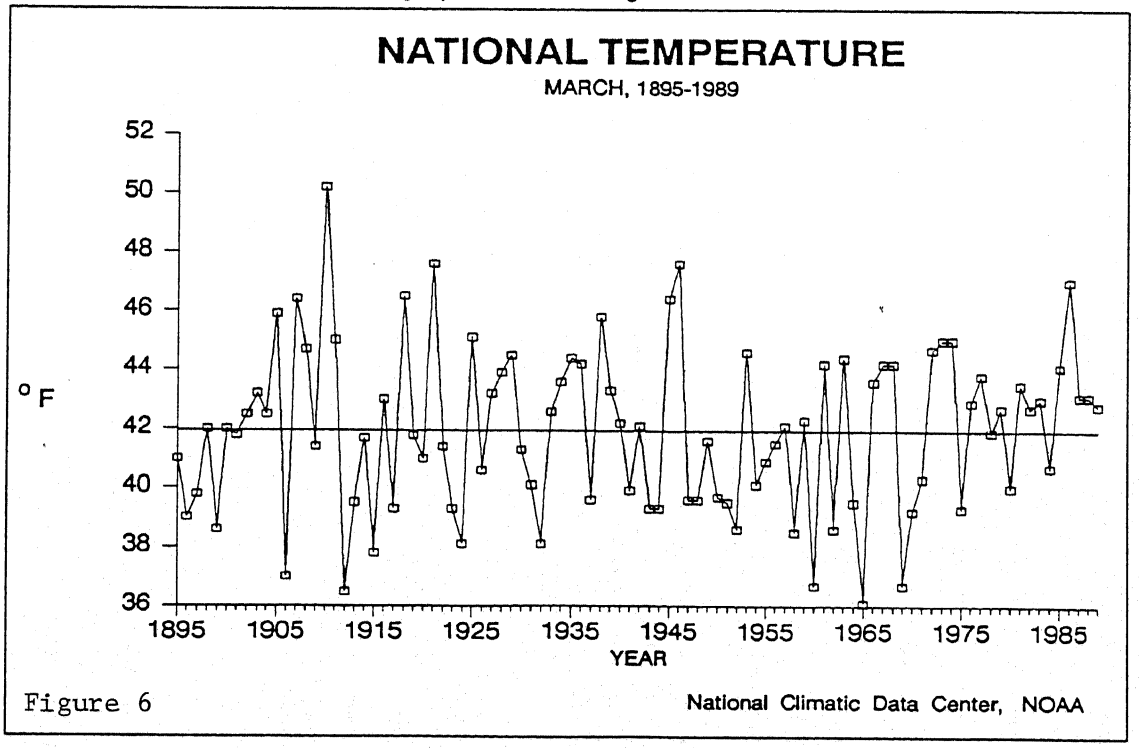


Figure 6 National Climatic Data Center, NOAA

The data are obtained from NCDC's cooperative data network. Individual stations are grouped into state climate divisions (344 in the contiguous U.S.) and an average monthly temperature and total precipitation value is calculated. An average state value is then determined for precipitation and temperature from the climate division values and are area-weighted. A national average for both temperature and precipitation is taken from these area-weighted state values and compared during the past 95 years (since 1895). Some climate division boundaries were different before 1931, but an algorithm was developed to compensate for the discrepancy. The number of cooperative stations has increased from approximately 500 in 1895 to nearly 8000 in 1989. The average (mean) value is depicted in each graph and incorporates the entire time preiod (95 years).

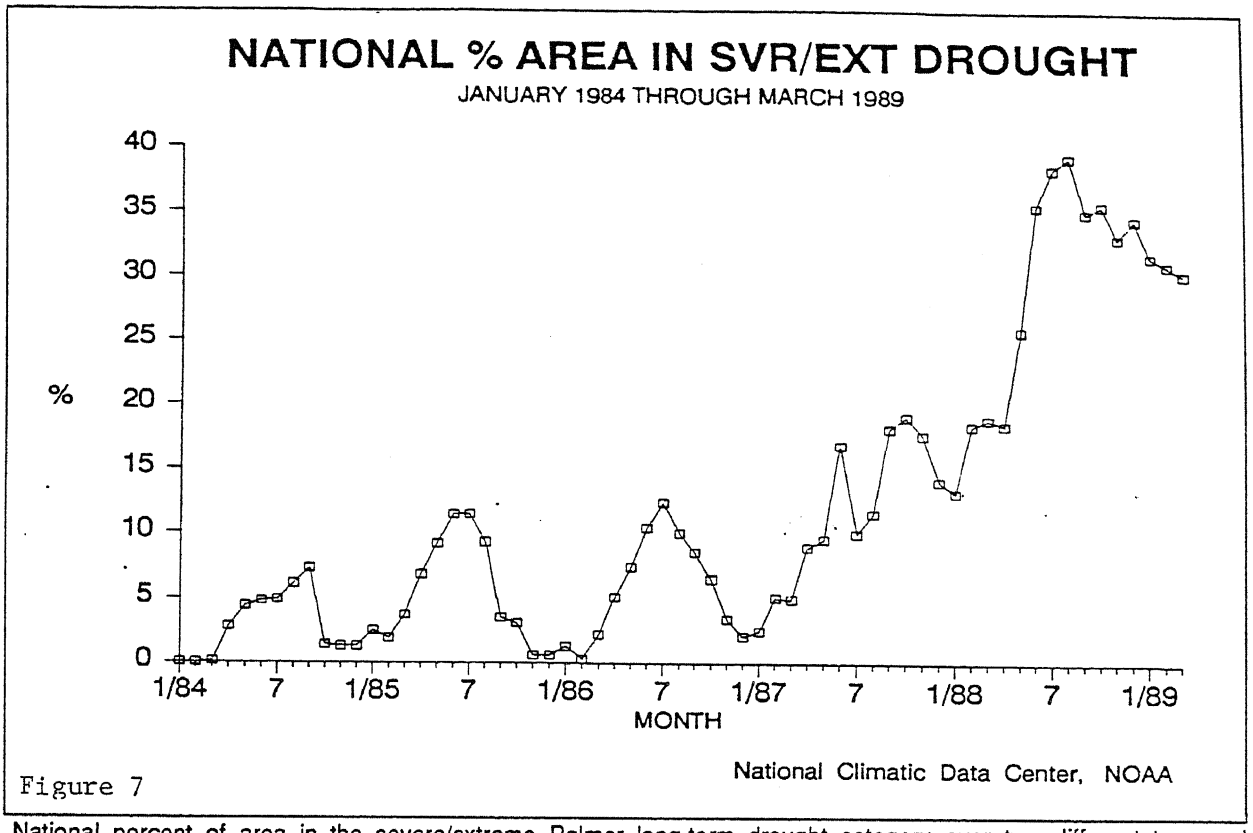


Figure 7

National percent of area in the severe/extreme Palmer long-term drought category over two different temporal periods (since 1984 and 1895). The nation has been slow to recover from the 1988 drought, with approximately 30% of the contiguous U.S. still in severe or extreme long-term drought as of the end of March 1989 (top). Historically, only nine other Marches since 1895 (mainly in the 1930's and 1950's) have observed larger areal drought (bottom).